

Cambridge IGCSE™

MATHEMATICS

0580/21

Paper 2 (Extended)

October/November 2025

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

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- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

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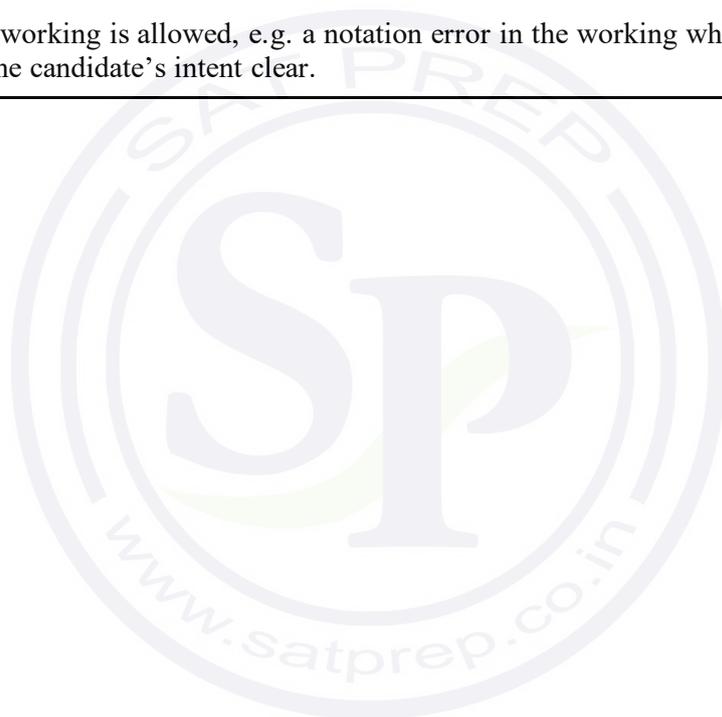
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
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Annotations guidance for centres

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We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	More information required
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	Omission
Off-page comment	Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to.
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	Premature rounding/approximation
	Special case
	Indicates that work/page has been seen
	Transcription error
	Correct
	Correct answer from incorrect working

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

- M** Method marks, awarded for a valid method applied to the problem.
- A** Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B** Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘dep’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

- awrt answers which round to
 cao correct answer only
 dep dependent
 FT follow through after error
 isw ignore subsequent working
 nfwf not from wrong working
 oe or equivalent
 rot rounded or truncated
 SC Special Case
 soi seen or implied

Question	Answer	Marks	Partial Marks
1	36, 54	2	M1 for $\frac{90}{2+3} \times k$ where $k = 1, 2$ or 3
2	25	3	M1 for $360 - 148 - 82$ M1 for $(180 - \text{their } 130) \div 2$
3	162	2	M1 for $180 - \frac{360}{20}$ or for $\frac{180(20-2)}{20}$
4	3	2	M1 for $\frac{1}{2} \times 8 \times h = 12$ oe
5(a)	Translation $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$	2	B1 for each
5(b)	Triangle at $(3, 1)$, $(3, -1)$, $(-1, -1)$	2	B1 for correct size and orientation but wrong position
6(a)	1 cao	1	
6(b)	25 cao	2	M1 for $(\sqrt[3]{125})^2$ or $\sqrt[3]{125^2}$ or $(5^3)^{\frac{2}{3}}$ or B1 for $\sqrt[3]{125} = 5$
7(a)	$\frac{p}{2}$ final answer	2	M1 for $\frac{p}{t} \times \frac{t}{2}$ or for cross cancelling of t
7(b)	$\frac{x+2}{4}$ or $\frac{x}{4} + \frac{1}{2}$ final answer	2	M1 for $\frac{3x-2(x-1)}{4}$ oe If 0 scored, SC1 for final answer $\frac{x-2}{4}$ oe
8	$3t + w = 51$ $6t + 5w = 129$	2	B1 for each
	Correctly eliminating one variable from <i>their</i> equations	M1	e.g. $6t + 2w = 102$ and $6t + 5w = 129$ leading to $3w = 27$ or $w = 51 - 3t$ and $6t + 5(51 - 3t) = 129$
	$[t =] 14$ $[w =] 9$	A2	A1 for $[t =] 14$ A1 for $[w =] 9$ If M1A0A0 scored, M1 SC1 for two values satisfying one of <i>their</i> original equations or if M0 scored, SC1 for 2 correct answers

Question	Answer	Marks	Partial Marks
9	9	2	B1 for 4.5 seen
10(a)	1, 3	1	
10(b)	5	1	
11	$\frac{8}{33}$ cao	2	B1 for $\frac{24}{99}$ oe or M1 for 24.24... – 0.24... oe
12	9π	4	M3 for a fully correct method e.g. $\frac{2\pi}{2\pi \times 9} \times \pi \times 9^2$ oe OR B2 for 40 or $\frac{1}{9}$ oe or M1 for $18 + k \times 2 \times \pi \times 9 = 18 + 2\pi$ oe M1 for $(their\ k) \times \pi \times 9^2$ oe OR SC2 for answer $81 + 9\pi$ oe
13	$\frac{68+2x}{10} = 8$ or better	M1	
	$x = 6$	A1	
	Lower quartile = 6.5 or 6.75 or 7 or upper quartile = 9	B1	
	2 or 2.25 or 2.5 nfw	A1	
14(a)	37 Angle sum of triangle = 180	2	B1 for each
	55 Angles in the same segment are equal	2	B1 for each
	125 Opposite angles of cyclic quadrilateral sum to 180	2	B1 for each
14(b)(i)	5.4	2	M1 for $\frac{4}{8} = \frac{2.7}{CX}$ oe
14(b)(ii)	4 : 1 oe	1	

Question	Answer	Marks	Partial Marks
15(a)	6.6×10^4	1	
15(b)	4.07×10^8	2	M1 for figs 407 or for 0.37×10^8 or 37×10^7 or $10^7(3.7 \times 10 + 3.7)$ or $10^8(3.7 + 3.7 \div 10)$ oe
16	$x \leq 2.5$ $y > 3$ $y \leq 4$ $y \leq 2x$	4	B3 for answer $x < 2.5$ $y \geq 3$ $y < 4$ $y < 2x$ OR B1 for each If 0 or 1 scored, instead award SC2 for recognition of $x = 2.5$, $y = 3$, $y = 4$, $y = 2x$ If 0 scored, SC1 for recognition of $y = 2x$
17(a)	91	2	M1 for $7(3^2 + 2^2)$ oe
17(b)	$[\pm]\sqrt{\frac{I}{M} - c^2}$ or $[\pm]\sqrt{\frac{I - Mc^2}{M}}$ final answer	3	M1 for correctly dividing by M M1 for correctly isolating term in k^2 M1 for correctly taking square root Maximum M2 if answer is incorrect
18	$[a =] 4$ $[b =] 16$ $[c =] 10$	4	B3 for two correct nfw OR B2 for $4x^2 + 20x + 25$ or B1 for three terms correct from $4x^2 + 10x + 10x + 25$ M1 for $2(2x + 5) + 5$ soi
19	$-\frac{8}{3}$ or $-2\frac{2}{3}$ oe	3	M2 for $-x = 2(x + 4)$ oe or M1 for $(3^{-1})^x$, 3^{-x} , $(3^2)^{x+4}$, $3^{2(x+4)}$ or $\left(\frac{1}{3}\right)^{-2(x+4)}$ oe

Question	Answer	Marks	Partial Marks
20(a)	0	1	
20(b)(i)	<p>Bag A</p> <p>Bag B</p> <p>white</p> <p>black</p> <p>white</p> <p>black</p>	2	B1 for $\frac{3}{8}$ or for $\frac{3}{4}$ and $\frac{1}{4}$ correctly placed on the same pair of branches
20(b)(ii)	$\frac{18}{32}$ oe	3	M2 for $\frac{5}{8} \times \text{their } \frac{3}{4} + \text{their } \frac{3}{8} \times \text{their } \frac{1}{4}$ oe or M1 for one correct branch e.g. $\frac{5}{8} \times \text{their } \frac{3}{4}$ or $\text{their } \frac{3}{8} \times \text{their } \frac{1}{4}$ oe
20(c)	$\frac{11}{40}$ oe	3	M2 for $\frac{5}{8} \times \frac{1}{5} + \frac{3}{8} \times \frac{2}{5}$ oe or M1 for one product of the form $\frac{5}{8} \times \frac{k}{5}$ or $\frac{3}{8} \times \frac{k}{5}$ oe ($k = 1, 2, 3$ or 4)
21(a)	$[a =] -9$ $[b =] 7$	2	B1 for each or for three correct terms from $6 + 9\sqrt{5} - 2\sqrt{5} - 3\sqrt{5}\sqrt{5}$ oe
21(b)	$3\sqrt{2}$ final answer	2	M1 for $\times \frac{\sqrt{2}}{\sqrt{2}}$ oe
22	-1 and 4	5	B2 for $x^2 - 3x - 4 [= 0]$ or M1 for $2(x + 2) = x(x - 1)$ or better M2 for a correct method to solve <i>their</i> three-term quadratic in the numerator or M1 for $(x + a)(x + b)$ where $ab = -4$ or $a + b = -3$ or $x(x - 4) + [1](x - 4)$ or $x(x + 1) - 4(x + 1)$ or M1 for $\sqrt{(-3)^2 - 4 \times [1] \times -4}$ or better or if in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then M1 for $p = -(-3)$ and $r = 2(1)$ or better

Question	Answer	Marks	Partial Marks
23	$(-1, 8)$	4	<p>B3 for $x = -1$</p> <p>OR</p> <p>M1 for $-2 - 2x$</p> <p>M1 for <i>their</i> derivative = 0</p> <p>OR</p> <p>M2 for $[x =] \frac{-(-2)}{2(-1)}$ or better</p> <p>or B1 for $\frac{-b}{2a}$</p> <p>OR</p> <p>M2 for $-((x + 1)^2 - 8) [= 0]$ oe or M1 for $[\pm](x + 1)^2 + k$</p>
24	$\frac{1}{6}\mathbf{a} + \frac{5}{4}\mathbf{b}$ final answer	4	<p>B3 for \overline{DM} or $\overline{MC} = -\frac{1}{4}\mathbf{b} + \frac{1}{6}\mathbf{a}$</p> <p>or \overline{MD} or $\overline{CM} = \frac{1}{4}\mathbf{b} - \frac{1}{6}\mathbf{a}$</p> <p>or B2 for $\overline{BD} = \frac{1}{2}\mathbf{b}$ or $\overline{OD} = \frac{3}{2}\mathbf{b}$</p> <p>or M1 for a correct route for \overline{OM}</p>
25	$\frac{5a+3b}{2x+5}$ final answer	4	<p>B2 for $(5a + 3b)(2x - 5)$</p> <p>or B1 for $5a(2x - 5) + 3b(2x - 5)$</p> <p>or for $2x(5a + 3b) - 5(5a + 3b)$</p> <p>B1 for $(2x + 5)(2x - 5)$</p>
26	150 and 330	3	<p>B2 for one correct answer</p> <p>or B1 for $[\tan^{-1} \dots] = 30$ or -30</p> <p>If 0 scored, SC1 for two answers in range with a difference of 180</p>

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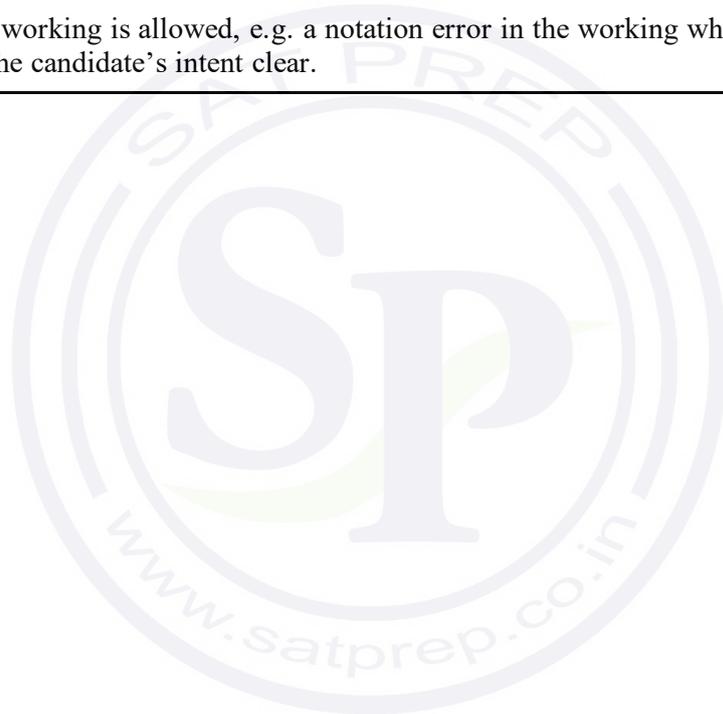
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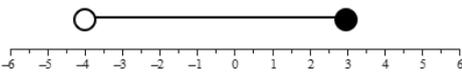
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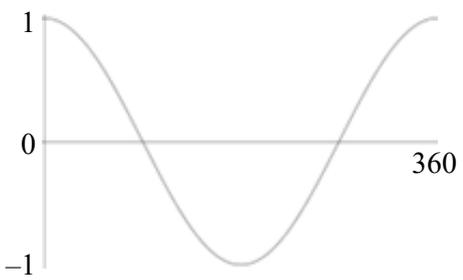
Question	Answer	Marks	Partial Marks
1	33	1	
2	1, 2, 4	1	
3	75	2	M1 for $6 \times 5 \times 2.5$ oe
4	448	2	M1 for 560×0.8 oe or B1 for 112
5(a)	150	2	M1 for $\frac{90}{360} [\times 600]$ oe
5(b)	Correctly completed pie chart including labels of car [72] and bus [138]	3	B2 for 72 or 138 or M1 for $\frac{120}{600} \times 360$ oe or B1FT for drawing one correct sector for <i>their</i> angle(s)
6(a)	105	1	
6(b)	80	1	
6(c)	125	2	FT $(180 - \textit{their (b)}) \div 2 + 75$ B1 for EAD or $EDA = 50$ or B1FT for EAD or $EDA = \frac{180 - \textit{their (b)}}{2}$ correctly evaluated or M1 for $(180 - \textit{their (b)}) \div 2 + 75$
7		2	B1 for open circle at -4 and closed circle at 3 or for a line between -4 and 3 (any circles)
8	$2000 - 40p$ final answer	2	B1 for $40p$ or $0.4p$ in final answer or $2000 - 40p$ seen then spoilt

Question	Answer	Marks	Partial Marks
9	$\frac{5}{21}$	3	<p>B2 for $\frac{16}{21}$ oe</p> <p>OR</p> <p>M1 for $1 - \frac{1}{3} - \frac{3}{7}$ oe</p> <p>M1 for converting $\frac{a}{3}$ and $\frac{b}{7}$ to two fractions with a common denominator e.g. $\frac{1}{3}$ (or <i>their</i> $(1 - \frac{1}{3})$) and $\frac{3}{7}$ to $\frac{7k}{21k}$ and $\frac{9k}{21k}$ or $\frac{14k}{21k}$ and $\frac{9k}{21k}$ where k is an integer</p>
10(a)	184 with 3, 8 and 10 shown	3	<p>B1 for 3, 8 and 10</p> <p>M1 for $3 \times 8 + 2 \times 8 \times 10$</p> <p>or</p> <p>for correct substitution of unrounded, truncated or incorrectly rounded values</p>
10(b)	$[m =] \frac{b}{d+2k}$ final answer	2	M1 for $[b =] m(d+2k)$
11(a)	<p>Three correct pairs with correct reasons</p> <p>$PQR = PST$ and corresponding angles</p> <p>$PRQ = PTS$ and corresponding angles</p> <p>$QPR = TPS$ and common angle</p> <p>OR</p> <p>Two correct pairs with correct reasons and correct similarity condition e.g. AAA</p>	3	<p>B2 for two correct pairs with correct reasons</p> <p>or B1 for one correct pair with correct reason</p>
11(b)	15	2	M1 for $\frac{3}{9} = \frac{5}{PQ}$ oe or better
11(c)	$16k$	2	M1 for 3^2 or $(\frac{1}{3})^2$ oe

Question	Answer	Marks	Partial Marks
12(a)	<p>or</p>	3	<p>If values placed: B2 for 55 correctly placed OR B1 for 25 correctly placed M1 for total $S = 60$ and total $C = 70$ with intersection not equal zero/not blank</p> <p>OR</p> <p>Alt method if probabilities placed: B2 for 0.55 oe correctly placed OR B1 for 0.25 oe correctly placed M1 for total $S = 0.6$ and total $C = 0.7$ with intersection not equal zero/not blank</p>
12(b)(i)	$\frac{70}{100}$ oe	1	
12(b)(ii)	$\frac{55}{100}$ oe	1	FT $\frac{\text{their } 55}{100}$ from <i>their</i> Venn diagram
12(b)(iii)	$\frac{85}{100}$ oe	1	FT $\frac{\text{their } 25 + \text{their } 5 + \text{their } 55}{100}$ or $1 - \frac{\text{their } 15}{100}$ from <i>their</i> Venn diagram
13(a)	$2^8 \times 3^3 \times 5^2 \times 7^{[1]}$ cao	2	M1 for $[14 =] 2 \times 7$ soi
13(b)	50 or -86400	2	M1 for $2^3 \times 3^3 [\times 5^0]$ or $2^6 \times 3^3 [\times 5^0]$ oe or $2^4 \times 5^2$ or 2×5^2 oe or SC1 for answers -50, [-]400, [-]1350, [-]3200, [-]10800, 86400 oe
14(a)	81	2	B1 for 3^4 or $3^2 \times 9$ or 9×9
14(b)	$[\pm] \frac{1}{64}$	2	M1 for $\frac{1}{4^3}$ or 64^{-1} or $\frac{1}{\sqrt{4096}}$

Question	Answer	Marks	Partial Marks
15(a)	$(x + 8)(x - 8)$ final answer	1	
15(b)	$(x - 2y)(11x - 12y)$ oe final answer	2	<p>M1 for $(x - 2y)(5x + 6(x - 2y))$ or for $(x + ay)(11x + by)$ where $ab = 24$ or $11a + b = -34$</p> <p>or for correct answer seen and spoilt.</p> <p>If 0 scored, SC1 for $11x^2 - 34xy + 24y^2$</p>
16	36	4	<p>M3 for $360 \div \left(\frac{360}{15} - 14 \right)$ oe</p> <p>or B2 for 24 or 156</p> <p>or M1 for $360 \div 15$ or $\frac{(15-2) \times 180}{15}$ oe</p>
17(a)	$3\sqrt{17}$ cao	5	<p>B4 for answer equivalent to $3\sqrt{17}$ but not in the correct form e.g. $\frac{3\sqrt{68}}{2}$, $\frac{6\sqrt{17}}{2}$, $\sqrt{153}$</p> <p>OR</p> <p>B3 for $\sqrt{68}$ or $2\sqrt{17}$ or M2 for $(9 - 1)^2 + (-5 - -3)^2$ oe or M1 for $(9 - 1)$ or $(-5 - -3)$ oe</p> <p>and</p> <p>M1 for $\sqrt{\text{their } 68} \times \frac{3}{2}$ oe</p>
17(b)	$(-4, 5)$	2	B1 for each coordinate
17(c)	$y = \frac{1}{4}x + 6$ final answer	4	<p>M1 for $[\text{grad } BD =] \frac{9-1}{-5--3}$ oe</p> <p>M1 for $[\text{grad } AC =] \frac{-1}{\text{their grad } BD}$</p> <p>M1 for <i>their</i> $(-4, 5)$ substituted into $y = \text{their } mx + c$ oe</p>

Question	Answer	Marks	Partial Marks
18	$2(4 - \sqrt{6})$ or $8 - 2\sqrt{6}$	3	M2 for $\frac{20(4-\sqrt{6})}{16+4\sqrt{6}-4\sqrt{6}-6}$ oe or better or M1 for $\frac{20}{4+\sqrt{6}} \times \frac{4-\sqrt{6}}{4-\sqrt{6}}$ oe
19	$\sqrt{99}$ and states this is less than 10 oe	3	B2 for $\sqrt{99}$ or M2 for $5^2 + 5^2 + 7^2$ oe or M1 for $5^2 + 5^2$ or $5^2 + 7^2$ oe
20(a)(i)	10	1	
20(a)(ii)	-17	2	M1 for $g(-7)$ oe or $3\left(\frac{21}{2x-1}\right) + 4$ oe soi
20(a)(iii)	$\frac{21+x}{2x}$ or $\frac{21}{2x} + \frac{1}{2}$ oe final answer	3	M2 for one step from answer e.g. $x = \frac{21+y}{2y}$ or $x = \frac{21}{2y} + \frac{1}{2}$ or $2y = \frac{21}{x} + 1$ or $2xy = 21 + x$ or $2y = \frac{21+x}{x}$ or M1 for correct first step e.g. $x = \frac{21}{2y-1}$ or better or $y(2x-1) = 21$ or better
20(b)	$\frac{5}{3}$ and $-\frac{5}{2}$ oe	5	B3 for $6x^2 + 5x - 25 [= 0]$ or M1 for $21 = (2x-1)(3x+4)$ oe B1 for $6x^2 - 3x + 8x - 4$ or better and M1 for correct method to solve <i>their</i> three-term quadratic e.g. $(3x-5)(2x+5) [= 0]$ or $\frac{-5 \pm \sqrt{5^2 - 4 \times 6 \times -25}}{12}$ oe

Question	Answer	Marks	Partial Marks
21(a)	Correct sketch to go through (0, 1), (180, -1) and (360, 1) 	2	M1 for correct cos curve shape through (0, 1) or for almost correct sketch within tolerance but with an omission at either end or for almost correct sketch within tolerance but with incorrect curvature in one place only
21(b)	150 and 210	3	B2 for one correct answer or M1 for $\cos x = -\frac{\sqrt{3}}{2}$ or better or B1 for 30 or -30 If M1, B1 or 0 scored, award SC1 for two answers in range with a sum of 360
22	[b =] 10 [c =] 37	3	B2 for $b = 10$ or $c = 37$ OR M1 for correct method for b e.g. <ul style="list-style-type: none"> • $(x + 5)^2 + 12$ • $2x + b = 0$ oe • $\frac{-b}{2} = -5$ M1 for correct method for c e.g. <ul style="list-style-type: none"> • $x^2 + 5x + 5x + 25$ [+ 12] oe • $12 = (-5)^2 + \text{their } b \times -5 + c$ oe • $c - \frac{(\text{their } b)^2}{4} = 12$ oe

Question	Answer	Marks	Partial Marks
23(a)	$\frac{240}{360} \times 2 \times \pi \times 12$ oe	M1	
23(b)	$\frac{(256\sqrt{5})\pi}{3}$ cao	6	<p>B5 for answer $\frac{(256\sqrt{5})}{3}$ or $\frac{(256\sqrt{5})\pi}{3}$ seen then spoilt</p> <p>or an answer equivalent to $\frac{(256\sqrt{5})\pi}{3}$ but not in required form</p> <p>OR</p> <p>B2 for radius of cone = 8 oe or M1 for $2\pi r = 16\pi$</p> <p>B2 for [height of cone =] $\sqrt{80}$ oe or M1 for $12^2 = \text{their } 8^2 + h^2$ or better</p> <p>M1dep for $\frac{1}{3} \times \pi \times \text{their } 8^2 \times \text{their } \sqrt{80}$ oe dep on attempt at Pythagoras to find height of cone</p>
24	$[n =] \frac{4}{3}$	2	B1 for $3^{3n[x]}$ or $3^{4[x]}$

Cambridge IGCSE™

MATHEMATICS

0580/23

Paper 2 (Extended)

October/November 2025

MARK SCHEME

Maximum Mark: 100

Published

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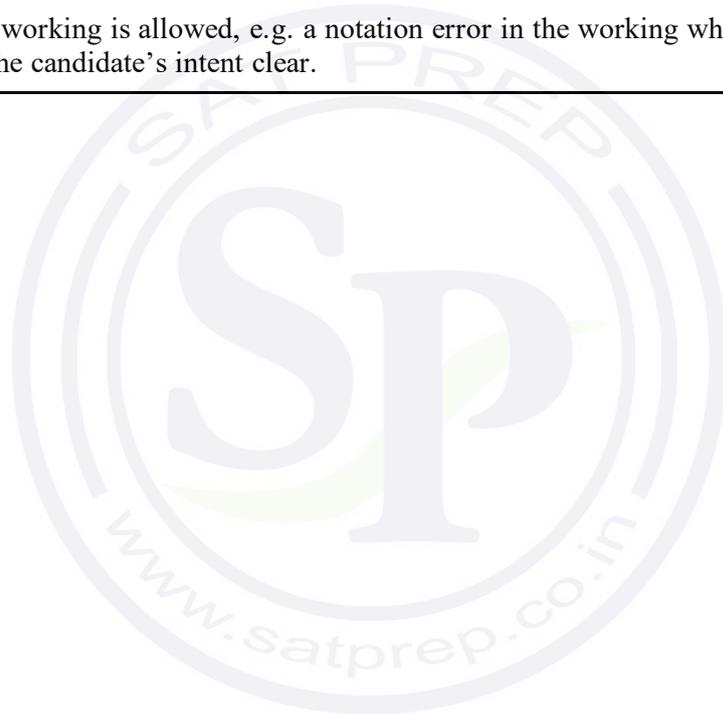
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GENERIC MARKING PRINCIPLE 6:

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	Indicates that work/page has been seen
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	Correct answer from incorrect working

MARK SCHEME NOTES

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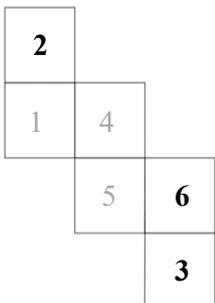
Types of mark

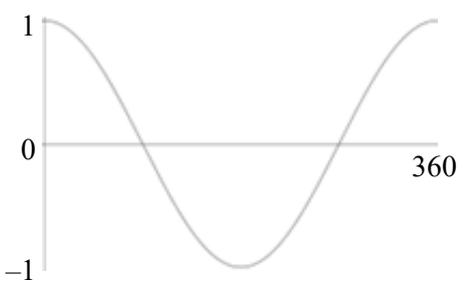
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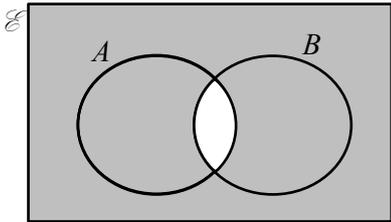
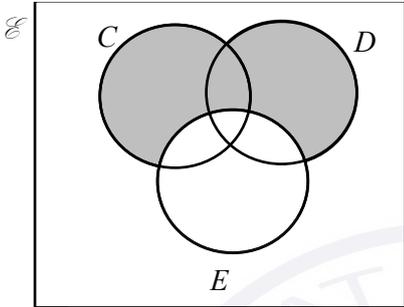
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Abbreviations

- awrt answers which round to
 cao correct answer only
 dep dependent
 FT follow through after error
 isw ignore subsequent working
 nfwf not from wrong working
 oe or equivalent
 rot rounded or truncated
 SC Special Case
 soi seen or implied

Question	Answer	Marks	Partial Marks
1	130	2	M1 for $180 - 2 \times 25$
2	15	1	
3		1	
4	86	2	M1 for $5 \times 3 + 19 \times 3 + 19 - 5$ oe
5	$x = 108$ $y = 72$	2	B1 for $x = 108$ or $y = 72$ or <i>their</i> $x + \textit{their} y = 180$
6(a)	A ring around the point (70, 60)	1	
6(b)	Point correctly plotted at (75, 140)	1	
6(c)	5	1	
6(d)	Positive	1	
7(a)	41	2	B1 for 11 or 13 seen with no more than one incorrect value
7(b)	12 or 13	1	
8(a)	$\begin{pmatrix} 15 \\ -20 \end{pmatrix}$	1	
8(b)	5	2	M1 for $3^2 + (-4)^2$ or better
8(c)	(1, -7)	2	B1 for each or for $\begin{pmatrix} 1 \\ -7 \end{pmatrix}$
9	10	1	
10(a)	$\sqrt{57}$	3	M2 for $11^2 - 8^2$ or M1 for $11^2 = AC^2 + 8^2$
10(b)	$\frac{8}{11}$	1	
11	$\frac{1}{9}$ oe	2	M1 for $\frac{2}{6} \times \frac{2}{6}$ oe

Question	Answer	Marks	Partial Marks
12(a)	1	1	
12(b)	63	2	M1 for $3^{-2} = \frac{1}{9}$ soi
12(c)	3^{11}	2	M1 for 3^3 or $(3^4)^2$ or better
13	23	4	M3 for $x + x + 44 + 90 = 180$ oe OR B1 for ODE or OBE or $BOA = 90^\circ$ B1 for $AOE = x$ or $OED = x$
14(a)	$x = -3$	1	
14(b)	$[y =] (x + 3)^2 - 5$	1	
15(a)	$(x - 3)(x - 4)$ final answer	2	B1 for $(x + a)(x + b)$ where $ab = 12$ or $a + b = -7$ or $x(x - 4) - 3(x - 4)$ or $x(x - 3) - 4(x - 3)$
15(b)	$(5 + 3n)(x + 2y)$ final answer	2	B1 for $5(x + 2y) + 3n(x + 2y)$ or $x(5 + 3n) + 2y(5 + 3n)$
16	$5n + 3$ oe final answer	2	B1 for answer $5n + j$ or $kn + 3$, $k \neq 0$ or $5n + 3$ seen then spoilt
	$\frac{n + 2}{n + 1}$ oe final answer	1	
	2^{n-3} oe final answer	2	B1 for answer 2^{an+b} , $a \neq 0$ oe or a correct answer seen then spoilt
17(a)	Correct sketch to go through (0, 1), (180, -1) and (360, 1) 	2	M1 for correct cos curve shape through (0, 1) or for almost correct sketch within tolerance but with an omission at either end or for almost correct sketch within tolerance but with incorrect curvature in one place only
17(b)	315	2	B1 for 45

Question	Answer	Marks	Partial Marks
18 (a)		1	
18 (b)		1	
19(a)	24π cao	2	M1 for $\frac{60}{360} \times \pi \times 12^2$ oe
19(b)	20π cao	3	M2 for $\frac{360-60}{360} \times \pi \times 12 \times 2$ oe or M1 for $\frac{k}{360} \times \pi \times 12 \times 2$ oe where $k < 360$
20	$\frac{311}{990}$ oe fraction	3	M2 for $314.14\dots - 3.14\dots$ oe or $\frac{113}{990} + \frac{198}{990}$ or M1 for $114.14\dots - 1.14\dots$ oe or $0.3\dot{1}4$ or $\frac{113}{990}$
21	62	4	B3 for $[m + 10 =] 118$ or B2 for $m = 108$ or $p = 72$ or M2 for $\frac{180}{3+2} \times 3$ or M1 for recognising opposite angles in a cyclic quadrilateral add up to 180° soi

Question	Answer	Marks	Partial Marks			
22	$[y =] 2x - 1$	3	M1 for $\frac{-1}{-0.5}$ oe M1 for (3, 5) correctly substituted into $y = (\text{their } 2)x + c$			
23	15	3	M1 for $\frac{1}{2} \times 6 \times 10 \times \sin 30$ oe B1 for $\sin 30 = \frac{1}{2}$ soi			
24(a)	$3\sqrt{5}$	2	B1 for $5\sqrt{5}$ or $2\sqrt{5}$			
24(b)	24	2	M1 for $6\sqrt{16}$ oe or $6\sqrt{2} \times 2\sqrt{2}$ or $3\sqrt{8} \times \sqrt{8}$			
24(c)	$\frac{\sqrt{7}-2}{3}$ or $\frac{1}{3}\sqrt{7} - \frac{2}{3}$	2	M1 for $\frac{1}{\sqrt{7}+2} \times \frac{\sqrt{7}-2}{\sqrt{7}-2}$ oe			
25(a)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>9</td></tr> <tr><td>10</td></tr> <tr><td>11</td></tr> </table>	9	10	11	1	
9						
10						
11						
25(b)	$\frac{2}{5}$ oe	2	FT for $\frac{\text{their } 2}{\text{their } 5}$ B1FT for $\frac{\text{their } 2}{k}$ where $\text{their } 2 \leq k \leq 9$ or for $\frac{c}{\text{their } 5}$ where $0 < c \leq \text{their } 5$			
26(a)	$\frac{3p}{5y}$ final answer cao	2	B1 for $\frac{15p}{25y}$ or $\frac{3mp}{5my}$ final answer or for correct answer spoilt			
26(b)	$\frac{11x-29}{(2x-5)(x-3)}$ final answer or $\frac{11x-29}{2x^2-11x+15}$ final answer	3	B1 for $3(x-3)+4(2x-5)$ or better seen B1 for common denominator of $(2x-5)(x-3)$ oe isw			

Question	Answer	Marks	Partial Marks
27	$[x =] 3, [y =] 7$ $[x =] 8, [y =] 22$	6	<p>M2 for $x^2 - 11x + 24 [= 0]$ oe simplified or M1 for $x^2 - 8x + 22 = 3x - 2$ oe or better</p> <p>M2 for correct method to solve <i>their</i> three-term quadratic e.g. $(x - 8)(x - 3) [= 0]$ or M1 for $x(x - 3) - 8(x - 3)$ or $x(x - 8) - 3(x - 8)$ or $(x + a)(x + b)$ where $ab = 24$ or $a + b = -11$</p> <p>B1 for $x = 3$ and $x = 8$ or $y = 7$ and $y = 22$ or one correct pair</p> <p>If B0 scored and at least two method marks scored SC1 for correct substitution of both of <i>their</i> x-values into $y + 2 = 3x$ or $y = x^2 - 8x + 22$</p>
28	$\frac{2x+3}{x+7}$ final answer	4	<p>B2 for $(2x + 3)(x - 7)$ or B1 for $2x(x - 7) + 3(x - 7)$ or $x(2x + 3) - 7(2x + 3)$ or $(2x + a)(x + b)$ where $ab = -21$ or $a + 2b = -11$</p> <p>B1 for $(x + 7)(x - 7)$</p>
29	$[R =] \frac{x}{31}$	5	<p>M1 for $\pi (2R)^2$ oe</p> <p>M1 for $2 \times \pi \times 2R \times 5R$ oe</p> <p>M1 for $\frac{4\pi(2R)^2}{2}$ oe</p> <p>M1 for $\pi \times R \times x + \pi \times R^2$ oe</p>

Cambridge IGCSE™

MATHEMATICS

0580/21

Paper 2 (Extended)

May/June 2025

MARK SCHEME

Maximum Mark: 100

Published

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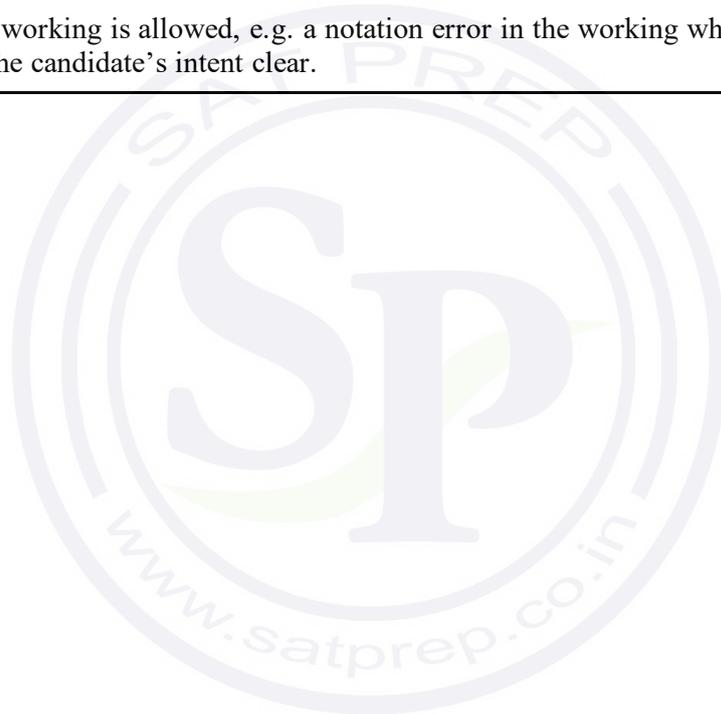
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2	$[w =] 158$ $[x =] 76$ $[y =] 82$	4	B1 for w correct B1 for x correct B2FT for $y = 158 - \text{their } x$ correctly evaluated or B1 for 22 (identified) or 82 in position vertically opposite to y or for $y = 158 - \text{their } x$
3	1770	3	B2 for 270 or M2 for $1500 + \frac{1500 \times 3 \times 6}{100}$ or M1 for $\frac{1500 \times 3 [\times 6]}{100}$
4	$\frac{7}{12}$ oe	3	M1 for $\frac{6}{24}$ oe M1 for correct use of common denominator in subtraction $\frac{5}{6} - \text{their } \frac{6}{24}$, e.g. $\frac{20}{24}$ and $\frac{6}{24}$ oe If 0 scored, SC1 for answer $\frac{1}{16}$ oe
5	12	2	M1 for $\frac{360}{180-150}$ or for $\frac{180(n-2)}{n} = 150$
6(a)	Correct line drawn	2	M1 for a line with gradient 2 or for a line with positive gradient and intercept at $y = 1$
6(b)	$[x =] 2, [y =] 5$	1	FT intersection of <i>their</i> (a) with the given line
7	$\frac{4}{15}$	3	B2 for $\frac{24}{90}$ oe or M1 for $26.66\dots - 2.66\dots$ oe or for $90x = 24$ oe or for $\frac{2}{10} + \frac{6}{90}$ oe
8(a)	$\begin{pmatrix} 14 \\ 13 \end{pmatrix}$	2	B1 for $\begin{pmatrix} 14 \\ k \end{pmatrix}$ or for $\begin{pmatrix} k \\ 13 \end{pmatrix}$ or for $\begin{pmatrix} 22 \\ 10 \end{pmatrix}$
8(b)	24	2	M1 for $y + 5^2 = 7^2$ or better
9	4 nfw	3	M2 for $8 + 20 + 8n = 6(2 + 4 + n)$ or better or M1 for $\frac{2 \times 4 + 4 \times 5 + n \times 8}{2 + 4 + n} [= 6]$ oe or $8 + 20 + 8n$ or $6(2 + 4 + n)$

Question	Answer	Marks	Partial Marks
10(a)	110	1	
10(b)	55	1	FT <i>their</i> $110 \div 2$
10(c)	55	1	FT <i>their</i> (b) Provided <i>their</i> (b) < 90
10(d)	15	1	FT $70 - \textit{their}$ (b) Provided <i>their</i> (b) < 70
11(a)	For correct ruled tangent and [<i>a</i> =] 1, [<i>b</i> =] 2	2	B1 for correct ruled tangent or both values correct without a correct tangent
11(b)	[<i>y</i> =] $5 - 3x$	3	3FT <i>their</i> (a) provided $m < 0, c \neq 0$ B1 for (<i>their</i> -3) $x + c$ or M1 for correct $\frac{\text{rise}}{\text{run}}$ for <i>their</i> line B1 for $mx + c$ where c is the correct intercept for <i>their</i> graph, $m \neq 0$
12(a)	1.4	2	B1 for [<i>UQ</i> =] 5.6 or for [<i>LQ</i> =] 4.2 or SC1 for 0.7
12(b)	5.4	2	B1 for 84 seen
13(a)	12.5 oe	5	M4 for $8[\pi]h = 100[\pi]$ OR M3 for $\pi \times 6 \times 10 + 2 \times \pi \times 6^2 = 2 \times \pi \times 4^2 + 2 \times \pi \times 4 \times h$ oe OR M1 for $\pi \times 6 \times 10 + 2 \times \pi \times 6^2$ oe M1 $2 \times \pi \times 4^2 + 2 \times \pi \times 4 \times h$ oe OR SC2 for answer 16.5
13(b)	14	3	M2 for $\sqrt{10^2 - 6^2}$ or M1 for $6^2 + x^2 = 10^2$
14(a)	-10	1	

Question	Answer	Marks	Partial Marks
14(b)	$\frac{x+4}{3}$ oe	2	M1 for correct first step $y + 4 = 3x$ or $x = 3y - 4$ or $\frac{y}{3} = x - \frac{4}{3}$
14(c)	$a = 12, b = -1$	2	B1 for either a or b correct or M1 for $3(4x + 1) - 4$
14(d)	$\frac{22-7x}{(3x-4)(4x+1)}$ or $\frac{22-7x}{12x^2-13x-4}$ final answer	3	B1 for $2(4x + 1) - 5(3x - 4)$ oe or better isw B1 for common denominator $(3x - 4)(4x + 1)$ oe isw
15(a)	$17 - 7\sqrt{5}$ final answer	2	B1 for 3 correct terms from $2 - 6\sqrt{5} - \sqrt{5} + 3 \times \sqrt{5} \times \sqrt{5}$ oe
15(b)	$\frac{3\sqrt{10}}{5}$ cao	2	M1 for $\frac{6}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}}$ oe
16	$3x^3 + 5x^2 - 34x - 24$ final answer	3	B2 for correct expansion unsimplified or simplified four-term expression of correct form with 3 terms correct or B1 for one pair of brackets expanded with at least 3 terms out of 4 correct
17(a)	$\frac{9}{100}$ oe	2	M1 for $\frac{3}{10} \times \frac{3}{10}$
17(b)(i)	$\frac{2}{5}$ $\frac{4}{5}$ $\frac{1}{5}$	2	B1 for $\frac{2}{5}$
17(b)(ii)	$\frac{16}{30}$ oe	3	3FT their tree diagram dep on probabilities < 1 M2FT for $\frac{4}{6} \times \frac{2}{5} + \frac{2}{6} \times \frac{4}{5}$ or M1FT for $\frac{4}{6} \times \frac{2}{5}$ or for $\frac{2}{6} \times \frac{4}{5}$
18(a)	$\frac{12}{x}$	1	
18(b)	$\frac{10}{x-4}$	1	

Question	Answer	Marks	Partial Marks
18(c)	<i>their</i> $\frac{10}{x-4} - \textit{their} \frac{12}{x} = 1$ oe	M1	
	$10x - 12x + 48 = x^2 - 4x$	M2	Correctly multiplying <i>their</i> brackets and clearing algebraic fractions e.g. $(x-4)\left(\frac{12}{x} + 1\right) = 10$ leading to $12 - \frac{48}{x} + x - 4 = 10$ and then $12x - 48 + x^2 - 4x = 10x$ or M1 for correctly clearing, or correctly collecting into a single fraction, two fractions both with different algebraic denominators e.g. $10x - 12(x-4) = x(x-4)$ or $\frac{10x - 12(x-4)}{x(x-4)} [= 1]$
	Leading to $0 = x^2 - 2x - 48$	A1	With no errors or omissions seen, dep on M3
18(d)	$(x+6)(x-8)$	M2	M1 for $x(x-8) + 6(x-8)$ or $x(x+6) - 8(x+6)$ or $(x+a)(x+b)$ where $ab = -48$ or $a+b = -2$
	-6, 8	B1	
18(e)	1.5 or $1\frac{1}{2}$	1	FT $\frac{12}{\textit{their} 8}$
19	$\frac{1}{9}$	2	M1 for 9^{-1} or for $\frac{1}{3^2}$ or $\frac{1}{\sqrt[3]{729}}$
20	$6\sqrt{3}$ oe	4	B1 for $\tan 30 = \frac{1}{\sqrt{3}}$ or $\frac{\sqrt{3}}{3}$ or for $\sin 60 = \frac{\sqrt{3}}{2}$ and $\sin 30 = \frac{1}{2}$ M2 for $\frac{6}{\tan 30}$ or $\frac{6\sin(60)}{\sin(30)}$ or M1 for $\frac{6}{x} = \tan 30$ or $\frac{\sin 60}{x} = \frac{\sin 30}{6}$
21(a)(i)	$2m - n$	1	
21(a)(ii)	$2m + n$	1	

Question	Answer	Marks	Partial Marks
21(b)	$\overline{CD} = 10\mathbf{m} - 5\mathbf{n}$	M2	Allow M2 for equivalents $\overline{CD} = -2\mathbf{n} + 10\mathbf{m} - 3\mathbf{n}$ or $\overline{CD} = -(2\mathbf{m} + \mathbf{n}) + 2\mathbf{m} - \mathbf{n} + 10\mathbf{m} - 3\mathbf{n}$ For M2 , FT <i>their (a)</i> e.g. $\overline{CD} = \text{their } \overline{CO} + \text{their } \overline{OA} + 10\mathbf{m} - 3\mathbf{n}$ or M1 for correct route for \overline{CD} using the lines of the diagram with \overline{AD} e.g. $\overline{CD} = \overline{CA} + \overline{AD}$ oe
	$\overline{CD} = 5\overline{OA}$ leading to CD is parallel to OA [$\therefore OACD$ is a trapezium]	A1	Dependent on M2
22(a)	$[n =] 3, [q =] - 6$	2	B1 for each correct value
22(b)	(1, 4) and (3, 0)	4	B3 for (1, 4) or (3, 0) or for two correct values of x or M2 for $[3](x - 1)(x - 3) [= 0]$ oe or $x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4 \times 3 \times 9}}{2 \times 3}$ oe or M1 for writing $\frac{dy}{dx} = 0$ or for $3x^2 - 12x + 9 = 0$
23	$\frac{2x}{x-5}$ final answer	3	B1 for $2x(x + 5)$ B1 for $(x - 5)(x + 5)$

Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2025

MARK SCHEME

Maximum Mark: 100

Published

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Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **11** printed pages.

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Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

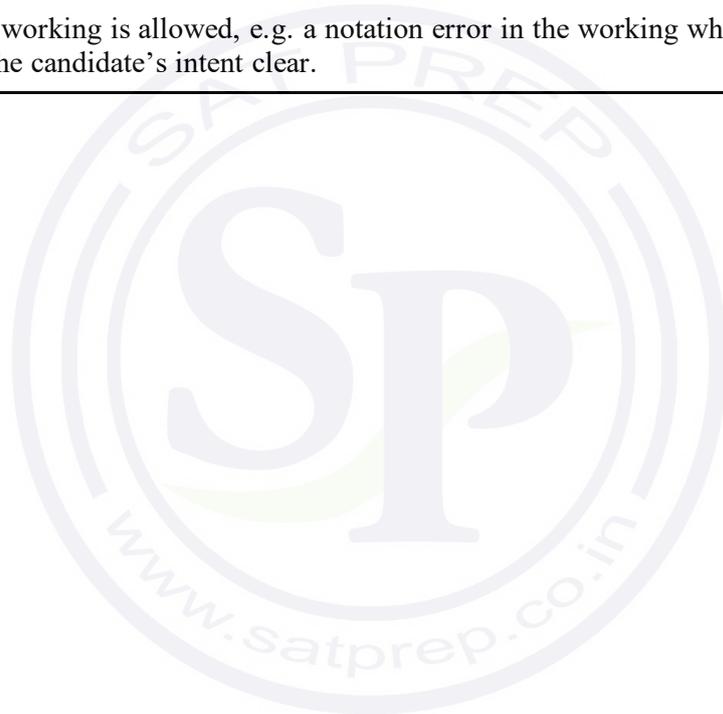
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.



Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	More information required
A0	Accuracy mark awarded zero
A1	Accuracy mark awarded one
A2	Accuracy mark awarded two
A3	Accuracy mark awarded three
B0	Independent mark awarded zero
B1	Independent mark awarded one
B2	Independent mark awarded two
B3	Independent mark awarded three
BOD	Benefit of the doubt
C	Communication mark
	Incorrect
FT	Follow through
Highlighter	Highlight a key point in the working
ISW	Ignore subsequent work
M0	Method mark awarded zero
M1	Method mark awarded one
M2	Method mark awarded two
M3	Method mark awarded three

Annotation	Meaning
	Misread
	Omission
Off-page comment	Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to.
On-page comment	Allows comments to be entered in speech bubbles on the candidate response.
	Premature rounding/approximation
	Special case
	Indicates that work/page has been seen
	Transcription error
	Correct
	Correct answer from incorrect working

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

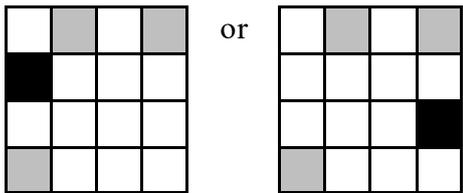
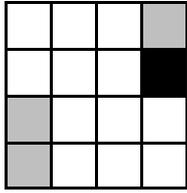
Types of mark

- M** Method marks, awarded for a valid method applied to the problem.
- A** Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B** Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘dep’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

- awrt answers which round to
 cao correct answer only
 dep dependent
 FT follow through after error
 isw ignore subsequent working
 nfwf not from wrong working
 oe or equivalent
 rot rounded or truncated
 SC Special Case
 soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)		1	
1(b)		1	
2(a)	4.4 to 4.6	2	B1 for 8.8 [cm] to 9.2 [cm] or M1 for $0.5 \times$ <i>their</i> written measurement where <i>their</i> measurement is in the range 8 to 10
2(b)	108 to 112	1	
3	$[x =] 70$ and $[y =] 65$	3	B2 for either correct or B1 for 45 and 65 correctly placed on diagram or M1 for $180 - 45 - 65$ oe
4(a)	$\frac{4}{7}$ oe	1	
4(b)	20	1	FT <i>their</i> (a) $\times 35$ provided $0 < \textit{their} \textbf{(a)} < 1$
5(a)	Triangle at $(-1, -1)$, $(-1, 1)$, $(-2, -1)$	1	
5(b)	Rotation 90 anticlockwise oe $(2, 2)$	3	B1 for each
6(a)	4	2	M1 for $8x = 39 - 7$ or better
6(b)	2.6 or $\frac{13}{5}$ oe	3	M1 for correct first step e.g. $5y - 1 = \frac{24}{2}$ or $10y - 2 = 24$ or better M1 for correctly isolating terms in y FT <i>their</i> first step e.g. $5y = 12 + 1$ or $10y = 24 + 2$
7(a)	-1	1	

Question	Answer	Marks	Partial Marks
7(b)	$14 - 3n$ oe final answer	2	B1 for $c - 3n$ or $14 - kn$ ($k \neq 0$) or $14 - 3n$ seen then spoilt
8	18	2	B1 for answer 2, 3, 6 or 9 or M1 for answer 2×3^2 oe or for $2 \times 2 \times 3 \times 3$ and $2 \times 3 \times 3 \times 3$ or 2 correct factor trees or tables
9(a)	(7, -9)	2	B1 for (7, k) or (k , -9) or $\begin{pmatrix} 7 \\ -9 \end{pmatrix}$ or for $\begin{pmatrix} 4 \\ -8 \end{pmatrix}$ seen or M1 for $\begin{pmatrix} 3 \\ -1 \end{pmatrix} + 2\begin{pmatrix} 2 \\ -4 \end{pmatrix}$
9(b)	2	2	M1 for $2^2 + ([-]4)^2$ oe or better
9(c)	$\begin{pmatrix} 3.5 \\ -2 \end{pmatrix}$ oe	2	B1 for answer $\begin{pmatrix} 3.5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$ or for $\begin{pmatrix} 0.5 \\ -1 \end{pmatrix}$ or $\begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}$ seen or M1 for $\begin{pmatrix} 3 \\ -1 \end{pmatrix} + \frac{1}{4}\begin{pmatrix} 2 \\ -4 \end{pmatrix}$ oe
10	$\frac{9}{2}$ oe	2	M1 for $\frac{45}{360} \times 2 \times [\pi] \times 18$ oe
11(a)	7.08×10^{-3} cao	1	
11(b)	4.18×10^{23} cao	2	B1 for figs 418 or M1 for 0.38×10^{23} or 38×10^{22} or $10^{22}(3.8 + 3.8 \times 10)$ or $10^{23}(3.8 \div 10 + 3.8)$ oe
12	16 and angle in a semicircle = 90 and angle sum of a triangle = 180	2	B1 for 16 or angle in a semicircle = 90

Question	Answer	Marks	Partial Marks
13(a)(i)	53	4	M1 for correct midpoints soi M1 for Σfx where x is in correct interval including boundaries M1 for $\Sigma fx \div 100$ dep on second M1
13(a)(ii)	Two correct bars with correct widths and heights 2 and 0.75	2	B1 for one correct bar or M1 for 40/20 oe and 30/40 oe soi
13(b)(i)	Correct diagram	3	B1 for correct horizontal placement for 6 plots B1 for correct vertical placement for 6 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 6 points If 0 scored, SC1 for 5 out of 6 points correctly plotted
13(b)(ii)(a)	62 to 64	1	FT <i>their</i> increasing curve or polygon reading at 40
13(b)(ii)(b)	46 to 48	1	FT <i>their</i> increasing curve or polygon reading at 20
14	$\frac{23}{90}$ oe fraction	2	M1 for 25.55... – 2.55... oe or for $90x = 23$ oe or for $\frac{2}{10} + \frac{5}{90}$ oe
15(a)	(2, 0)	1	
15(b)	$x = 0, y = -1$	2	B1 for each
15(c)	$y = x$ ruled	B1	
	$x = -2$ and $x = 1$	B2	B1 for one correct or for two correct answers FT from <i>their</i> line

Question	Answer	Marks	Partial Marks
16	168π	4	<p>B3 for answer 168</p> <p>OR</p> <p>M3 for $\pi \times 6^2 + \frac{1}{2} \times 4\pi \times 6^2 + 2\pi \times 6 \times 5$ oe</p> <p>OR</p> <p>To a maximum of 2 marks ignoring extra areas added or subtracted</p> <p>M1 for $\pi \times 6^2$</p> <p>M1 for $\frac{1}{2} \times 4 \times \pi \times 6^2$ oe</p> <p>M1 for $2 \times \pi \times 6 \times 5$</p>
17(a)	25	2	<p>M1 for $(\sqrt[3]{125})^2$ or $\sqrt[3]{125^2}$ or $(5^3)^{\frac{2}{3}}$ or B1 for $\sqrt[3]{125} = 5$</p>
17(b)	$[\pm] \frac{1}{32}$	2	<p>M1 for $\frac{1}{2^5}$ or 32^{-1} or $\frac{1}{\sqrt{1024}}$</p>
18(a)	$3\sqrt{3}$ cao	2	<p>M1 for $\frac{9}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ oe</p>
18(b)	$[c =] -1$ $[k =] 14$	2	<p>B1 for each</p> <p>or for 3 correct terms from $5 + 15\sqrt{2} - \sqrt{2} - 3\sqrt{2}\sqrt{2}$ oe</p>
19(a)	$\frac{5b}{2}$ cao final answer	2	<p>B1 for $\frac{15ab}{6a}$ or better seen</p>
19(b)	$\frac{2p+3t}{4}$ cao final answer	2	<p>M1 for adding two correct fractions with a common denominator e.g. $\frac{4p}{8} + \frac{6t}{8}$</p>
19(c)	$\frac{8-x}{(x-2)(x+1)}$ or $\frac{8-x}{x^2-x-2}$ cao final answer	3	<p>B1 for $2(x+1) - 3(x-2)$ or better isw</p> <p>B1 for common denominator $(x-2)(x+1)$ oe isw</p>

Question	Answer	Marks	Partial Marks
20(a)	$[\pm] 1$	3	<p>M1 for $2 = \frac{k}{\sqrt{9}}$ oe</p> <p>M1 for $\frac{\text{their } k}{\sqrt{36}}$</p> <p>OR</p> <p>M2 for $2 \times \sqrt{9} = y \times \sqrt{36}$</p>
20(b)	$\frac{1}{2}$ oe	1	
21(a)	<p>$[A =] -\sqrt{3}$ oe</p> <p>$[B =] \sqrt{3}$ oe</p>	3	<p>B2 for $-\sqrt{3}$ oe or $\sqrt{3}$ oe</p> <p>or M1 for $[x](3-x^2)[=0]$ or better</p> <p>or $\frac{0 \pm \sqrt{0^2 - 4 \times -1 \times 3}}{2 \times -1}$ oe</p>
21(b)(i)	$3 - 3x^2$ final answer	2	B1 for 3 or $-3x^2$ correct in an expression or for correct answer spoilt
21(b)(ii)	<p>$[P =] (-1, -2)$ and $[Q =] (1, 2)$</p>	4	<p>B3 for $(-1, -2)$ or $(1, 2)$ or for two correct values of x</p> <p>or M2 for $x^2 = 1$</p> <p>or for $[3](1-x)(1+x) [=0]$ oe factorised</p> <p>or $\frac{0 \pm \sqrt{0^2 - 4 \times -3 \times 3}}{2 \times -3}$ oe</p> <p>OR</p> <p>M1 for $[3](1-x^2) [=0]$</p> <p>or <i>their</i> (b)(i) = 0</p> <p>or for stating $\frac{dy}{dx} = 0$</p> <p>M1 for correct method to solve <i>their</i> quadratic</p>
22(a)	$\sqrt{3}$	1	
22(b)	30, 150	3	<p>B2 for 30 or 150</p> <p>or M1 for $\sin x = \frac{1}{2}$</p> <p>If 0 or M1 scored, SC1 for one acute angle and one obtuse angle with a sum of 180</p>

Question	Answer	Marks	Partial Marks
23	$2\mathbf{a} + \frac{1}{2}\mathbf{b}$ final answer	3	<p>B2 for a correct route in terms of a and b not in its simplest form</p> <p>or for \overline{AM} (or $\frac{1}{2}\overline{AC}$) = $\mathbf{a} + \frac{1}{2}\mathbf{b}$ oe</p> <p>or B1 for $\overline{AC} = -\mathbf{a} + \mathbf{b} + 3\mathbf{a}$ oe</p> <p>or M1 for correct route for \overline{OM} using the lines of the diagram</p>
24	(5, 38) and (-3, -18)	5	<p>B4 for one correct coordinate</p> <p>or for $x = 5$ and $x = -3$</p> <p>OR</p> <p>M2 for $x^2 - 2x - 15 [= 0]$ or $y^2 - 20y - 684 [= 0]$</p> <p>or M1 for $7x + 3 = x^2 + 5x - 12$ oe</p> <p>or $y = \left(\frac{y-3}{7}\right)^2 + 5\left(\frac{y-3}{7}\right) - 12$</p> <p>M1 for correct method to solve <i>their</i> three-term quadratic $(x - 5)(x + 3)$</p> $\frac{-(-2) \pm \sqrt{(-2)^2 - 4 \times 1 \times -15}}{2 \times 1} \text{ oe}$ <p>If B0 scored and at least 2 method marks scored, SC1 for correct substitution of both of <i>their</i> x values or <i>their</i> y values into $y = 7x + 3$ or $y = x^2 + 5x - 12$</p>

Cambridge IGCSE™

MATHEMATICS

0580/23

Paper 2 (Extended)

May/June 2025

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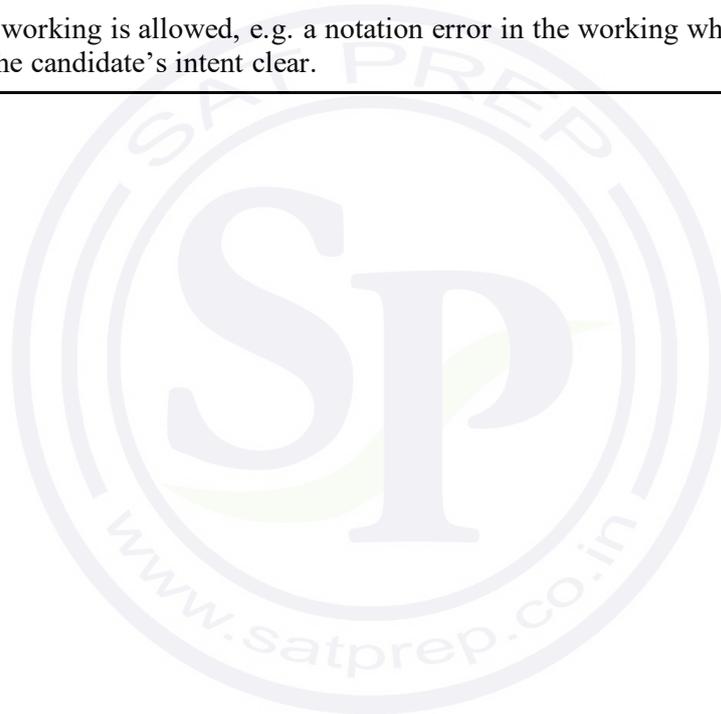
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- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
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Annotations

Annotation	Meaning
	More information required
A0	Accuracy mark awarded zero
A1	Accuracy mark awarded one
A2	Accuracy mark awarded two
A3	Accuracy mark awarded three
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BOD	Benefit of the doubt
C	Communication mark
	Incorrect
FT	Follow through
Highlighter	Highlight a key point in the working
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	Correct
	Correct answer from incorrect working

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

- M** Method marks, awarded for a valid method applied to the problem.
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Abbreviations

- awrt answers which round to
 cao correct answer only
 dep dependent
 FT follow through after error
 isw ignore subsequent working
 nfwf not from wrong working
 oe or equivalent
 rot rounded or truncated
 SC Special Case
 soi seen or implied

Question	Answer	Marks	Partial Marks																								
1	0.83 oe	1																									
2	$x = 84$ $y = 75$	4	B2 for $x = 84$ or M1 for $CDA = 76$ or $360 - 70 - 130 - (180 - 104)$ oe B2 for $y = 75$ or M1 for $(180 - 30) \div 2$																								
3(a)	4	1																									
3(b)	E and M	1																									
4	Positive	1																									
5(a)	Enlargement [Scale factor] 3 (1, 2)	3	B1 for each																								
5(b)(i)	Triangle at $(-6, 1)$, $(-3, 3)$, $(-4, 4)$	2	B1 for reflection in $x = k$ or in $y = -1$																								
5(b)(ii)	Triangle at $(4, -5)$, $(6, -2)$, $(7, -3)$	2	B1 for correct 90° anticlockwise rotation about $(1, -2)$ or correct orientation, wrong centre																								
6	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td style="border: none;">2</td> <td style="border: none;">5</td> <td style="border: none;">6</td> <td colspan="5" style="border: none;"></td> </tr> <tr> <td style="border: none;">3</td> <td style="border: none;">2</td> <td style="border: none;">7</td> <td style="border: none;">7</td> <td style="border: none;">9</td> <td style="border: none;">9</td> <td style="border: none;">9</td> <td style="border: none;">9</td> </tr> <tr> <td style="border: none;">4</td> <td style="border: none;">1</td> <td style="border: none;">1</td> <td style="border: none;">4</td> <td style="border: none;">5</td> <td style="border: none;">7</td> <td style="border: none;">8</td> <td style="border: none;"></td> </tr> </tbody> </table>	2	5	6						3	2	7	7	9	9	9	9	4	1	1	4	5	7	8		3	B1 for each correct row
2	5	6																									
3	2	7	7	9	9	9	9																				
4	1	1	4	5	7	8																					
7(a)	$\frac{1}{4}$ cao	2	M1 for correct method to find common denominator e.g. $\frac{10}{12}$ and $\frac{7}{12}$, $\frac{60}{72}$ and $\frac{42}{72}$																								
7(b)	$2\frac{1}{2}$ cao	3	M2 for $\frac{4}{3} \times \frac{15}{8}$ or $\frac{20}{15} \div \frac{8}{15}$ oe with common denominator or M1 for $\frac{4}{3}$ or for $\frac{\text{their } k}{3} \times \frac{15}{8}$, where $k > 3$																								
8(a)	$2 \times 3 \times 7$	2	B1 for 2, 3, 7 or M1 for correct factor tree/diagram/table																								

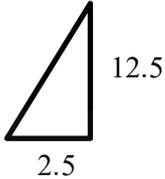
Question	Answer	Marks	Partial Marks																				
8(b)	14	2	B1 for answer 2 or 7 or M1 for 2×7 as final answer or $84 = 2 \times 2 \times 3 \times 7$ and $70 = 2 \times 5 \times 7$ or 2 correct factor trees or tables																				
9(a)	$\frac{3}{5}$ or 0.6 and -4	4	M1 for $5x^2 + 17x - 12 [= 0]$ M2 for correct method to solve <i>their</i> $ax^2 + bx - c [= 0]$ e.g. factorising $(5x - 3)(x + 4) [= 0]$, completing the square or using the formula or M1 for $(5x + a)(x + b)$ where $ab = -12$ or $5b + a = 17$ or correct partial factorisation e.g. $5x(x + 4) - 3(x + 4)$ or for $\sqrt{17^2 - 4(5)(-12)}$ or better or $\frac{-17 + \sqrt{d}}{2(5)}$ or $\frac{-17 - \sqrt{d}}{2(5)}$																				
9(b)	-6	1																					
10	$[x =] 2$ $[y =] -1$	4	M1 for correctly equating one set of coefficients or for making x or y the subject of one equation M1 for correct method to eliminate one variable A1 for $x = 2$ A1 for $y = -1$ If M0 scored, SC1 for 2 values satisfying one of the original equations																				
11(a)	<p style="text-align: center;">First number</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: right;">+</td> <td style="border: 1px solid black; padding: 5px;">1</td> <td style="border: 1px solid black; padding: 5px;">2</td> <td style="border: 1px solid black; padding: 5px;">3</td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">4</td> <td style="border: 1px solid black; padding: 5px;">5</td> <td style="border: 1px solid black; padding: 5px;">6</td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">5</td> <td style="border: 1px solid black; padding: 5px;">6</td> <td style="border: 1px solid black; padding: 5px;">7</td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">6</td> <td style="border: 1px solid black; padding: 5px;">7</td> <td style="border: 1px solid black; padding: 5px;">8</td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">7</td> <td style="border: 1px solid black; padding: 5px;">8</td> <td style="border: 1px solid black; padding: 5px;">9</td> </tr> </table> <p style="margin-left: 20px;">Second number</p>	+	1	2	3		4	5	6		5	6	7		6	7	8		7	8	9	2	B1 for 4 correct
+	1	2	3																				
	4	5	6																				
	5	6	7																				
	6	7	8																				
	7	8	9																				
11(b)	$\frac{2}{5}$ oe	2	B1 for answer $\frac{c}{5}$ where $c < 5$ or $\frac{2}{5}$ seen in working																				

Question	Answer	Marks	Partial Marks
12(a)	$\begin{pmatrix} 10 \\ -15 \end{pmatrix}$	1	
12(b)	10	4	<p>B3 for answer ± 10</p> <p>OR</p> <p>M3 for $(-4 - 4)^2 + (0 - 6)^2$ oe or better</p> <p>OR</p> <p>M2 for $\begin{pmatrix} -4 \\ 0 \end{pmatrix} - \begin{pmatrix} 4 \\ 6 \end{pmatrix}$ oe</p> <p>or B1 for $[J =] (4, 6)$ soi or $\begin{pmatrix} -1 \\ -8 \end{pmatrix}$</p> <p>M1 for $(their -8)^2 + (their -6)^2$ oe or better</p>
13(a)	120 and opposite angles of a cyclic quadrilateral sum to 180°	2	B1 for 120 or a fully correct reason
13(b)	25	2	M1 for $(180 - 120) - 35$ or B1 for $ABC = 60$ or $ABD = 35$
14	$90x^4y^3$ final answer	2	B1 for two correct parts from: $90, x^4$ and y^3 or for $3 \times 5 \times x \times y \times y \times y$ and $2 \times 3 \times 3 \times x \times x \times x \times x \times y$ or for correct answer seen then spoilt
15(a)	$5\sqrt{3}$	2	B1 for $3\sqrt{3}$ or $2\sqrt{3}$
15(b)	16	2	M1 for $40 \times 2\sqrt{2}$, $8 \times 2\sqrt{2}$, $\frac{8\sqrt{4}\sqrt{2}}{\sqrt{2}}$ or $\frac{40\sqrt{8}\sqrt{2}}{5\sqrt{2}\sqrt{2}}$ or better or B1 for $8\sqrt{4}$ or $\sqrt{256}$
15(c)	$\frac{3+\sqrt{5}}{4}$	2	M1 for $\frac{1}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}}$ oe

Question	Answer	Marks	Partial Marks
16	$\frac{65}{198}$ cao	3	B2 for a fraction equivalent to $\frac{65}{198}$ e.g. $\frac{325}{990}$ or M1 for $328.\dot{2}\dot{8} - 3.\dot{2}\dot{8}$ oe or $\frac{3}{10} + \frac{28}{990}$ oe or $990x = 325$ or $\frac{k}{990}$
17	21	3	M2 for $7 \times \sqrt{\frac{540}{60}}$ oe or $7 \div \sqrt{\frac{60}{540}}$ oe or M1 for $\sqrt{\frac{540}{60}}$ oe or $\sqrt{\frac{60}{540}}$ oe or $\left(\frac{7}{H}\right)^2 = \frac{60}{540}$ oe
18	$[t =] \frac{m}{2p+m}$ final answer	4	M1 for correctly clearing <i>their</i> fraction M1 for correct expansion M1 for correctly collecting <i>their</i> terms in t on one side and other terms on the other side, not dividing by $1 - t$ M1 for correct factorisation and division of <i>their</i> two-term expression in t To a maximum of 3 marks for an incorrect answer
19	$\frac{x}{7+x}$ final answer	3	B1 for $x(7-x)$ B1 for $(7-x)(7+x)$
20	$\frac{32}{3}\pi$ or $10\frac{2}{3}\pi$ cao	3	M2 for $\frac{360-40}{360} \times \pi \times 6 \times 2$ or $\frac{360-40}{360} \times \frac{22}{7} \times 6 \times 2$ oe or M1 for $\frac{40}{360} \times \pi \times 6 \times 2$ oe or B1 for major sector angle = 320 soi or 12π
21(a)	$3x^2 - 6x$ or $3x(x - 2)$	2	B1 for $3x^2 - kx$ or $kx^2 - 6x$ or correct answer spoilt or SC1 for $3x^2 - 6x + 1$

Question	Answer	Marks	Partial Marks
21(b)	(0, 1) (2, -3)	4	<p>B3 for one correct coordinate or for two correct values of x following $3x^2 - 6x$ oe seen in (b)</p> <p>or M2 for $[3]x(x - 2) [= 0]$ or $\frac{- -6 \pm \sqrt{(-6)^2 - 4 \times 3 \times 0}}{2 \times 3} [= 0]$ oe</p> <p>OR</p> <p>M1 for <i>their</i> $\frac{dy}{dx} = 0$ or stating $\frac{dy}{dx} = 0$</p> <p>M1 for correct method to solve <i>their</i> quadratic</p>
22(a)	11	1	
22(b)	$\frac{x-5}{2}$	2	<p>M1 for correct first step $x = 2y + 5$ or $y - 5 = 2x$ or $\frac{y-5}{2} = x$ or $\frac{y}{2} = x + \frac{5}{2}$</p>
22(c)	14	3	<p>M2 for $x - 4 = (25 - 5) \div 2$ oe or better or $2x - 8 = 25 - 5$ oe or better or M1 for $2(x - 4) + 5 = 25$</p>
22(d)	25	2	M1 for $h(2)$ or 5^2
23(a)	0	1	

Question	Answer	Marks	Partial Marks
23(b)	$[x =] \frac{4n}{\sqrt{3}}$ or $\frac{4n\sqrt{3}}{3}$ oe	5	<p>B4 for correct explicit expression to find x e.g. $x = \frac{2n}{\cos 30}$ or $x = \frac{2n}{\frac{\sqrt{3}}{2}}$ oe</p> <p>OR</p> <p>M3 for correct explicit method to find x with 2 trig functions e.g. $x = \frac{n \div \sin 30}{\cos 30}$ oe or a correct implicit method with one trig function e.g. $\cos 30 = \frac{2n}{x}$ oe</p> <p>OR</p> <p>B2 for hypotenuse of lower triangle = $2n$ or M2 for any correct implicit method with 2 trig functions e.g. $\cos 30 = \frac{n \div \sin 30}{x}$ oe</p> <p>OR</p> <p>M1 for seeing any correct trig value from $\sin 30$ or $\cos 60 = 0.5$, $\cos 30$ or $\sin 60 = \frac{\sqrt{3}}{2}$ or $\tan 30 = \frac{\sqrt{3}}{3}$ oe or for hypotenuse of lower triangle = $\frac{n}{\sin 30}$ oe</p>
24(a)(i)	19.5	1	
24(a)(ii)	$[a =] b - 5$ oe	3	<p>M1 for $3 = \frac{27-12}{b-a}$ oe</p> <p>M1 for $3(b-a) = 27-12$ or better e.g. $[a =] b - \frac{27-12}{3}$</p>

Question	Answer	Marks	Partial Marks
24(b)	$(20.5, 26.5)$ or $(\frac{41}{2}, \frac{53}{2})$	3	<p>SC2 for answer $(25.5, 51.5)$ or $(\frac{51}{2}, \frac{103}{2})$</p> <p>OR</p> <p>M2 for $23 - \frac{5}{2}(23 - 22)$ or $39 - \frac{5}{2}(39 - 34)$ oe or sketch</p>  <p>or vector e.g. $\begin{pmatrix} 2.5 \\ 12.5 \end{pmatrix}$ or $\begin{pmatrix} -2.5 \\ -12.5 \end{pmatrix}$</p> <p>or M1 for</p>  <p>$\frac{5}{2}(23 - 22)$ or $\frac{5}{2}(39 - 34)$ or vector e.g. $\begin{pmatrix} 1 \\ 5 \end{pmatrix}$ or $\begin{pmatrix} -1 \\ -5 \end{pmatrix}$</p>

Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

February/March 2025

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the February/March 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **13** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

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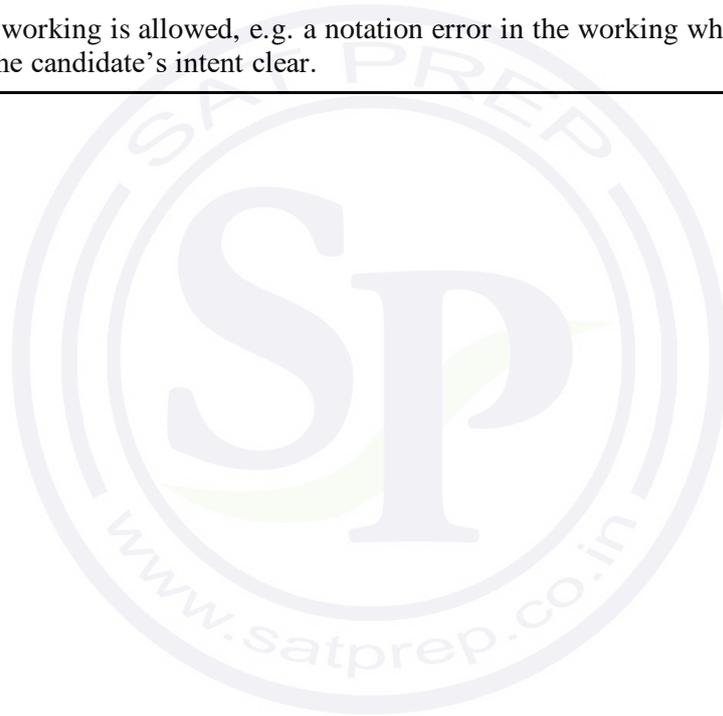
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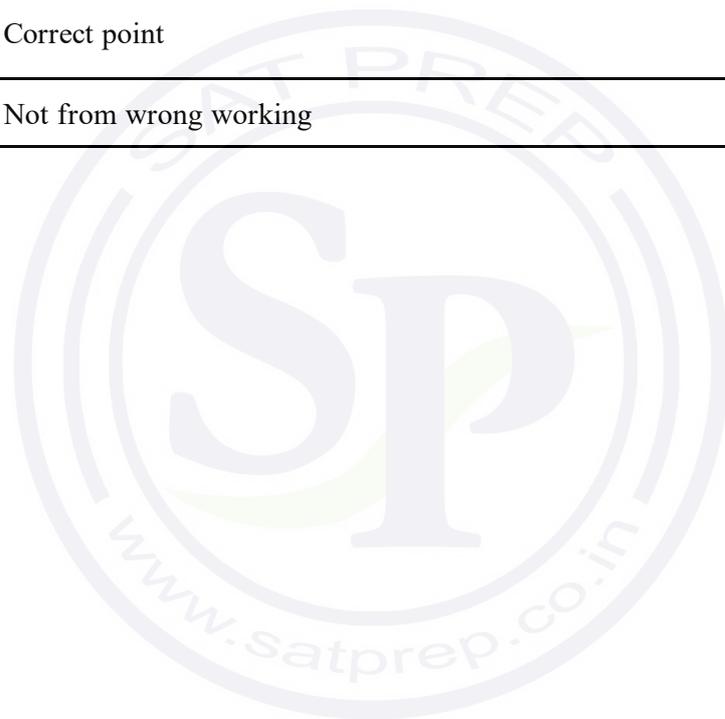
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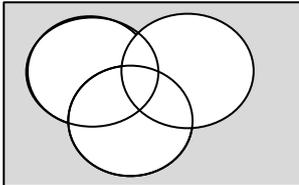
Question	Answer	Marks	Partial Marks
1	1980	1	
2	2 hours 38 min	1	
3	Kite	1	
4(a)	360	2	M1 for $4 \times 10 \times (-3)^2$ oe If 0 scored, SC1 for answer -360
4(b)	20	2	M1 for $[p^2 =] 3200 \div (2 \times 4)$ oe
5	0.00002 km, 2.9 cm, 0.03 m, 32 mm	2	B1 for three in correct order or M1 for lengths all converted correctly to a consistent unit to enable comparison
6	96	2	M1 for $\frac{15+9}{2} \times 8$ oe

Question	Answer	Marks	Partial Marks
7	$-3 < x \leq 4$	2	B1 for $-3 < x$ or $x \leq 4$
8(a)	0.45 oe	2	M1 for $1 - (0.3 + 0.25)$ oe
8(b)	36	1	
9	5 with 2, 10 and 8 shown	3	B2 for $\sqrt{\frac{200}{8}}$ or better or M1 for two of 2, 10 or 8
10	Finds number of sides 6 and 12 with appropriate supporting working for each value.	5	B2 for 120 and 150 or M1 for $360 \div (3 + 4 + 5) \times k$ oe where $k = 1, 3, 4$ or 5 M1 for $\frac{360}{180 - \text{their}120}$ or $\frac{180(n-2)}{n} = \text{their}120$ oe M1 for $\frac{360}{180 - \text{their}150}$ or $\frac{180(n-2)}{n} = \text{their}150$ oe
11(a)	Graph completed 85% on website with 15% in shops and correct shading	2	M1 for 85 [%] soi
11(b)	1.4 [million]	3	B2 for 2.1 [million] or M2 for $\frac{40}{100} \times 3.5$ [million] oe or M1 for $\frac{60}{100} \times 3.5$ [million] oe or B1 for 40 [%] oe If 0 scored SC1 for answer 1.96, 0.875 or 0.525 [million] oe
11(c)	25[%]	3	M2 for $\frac{7.5-6}{6} [\times 100]$ or $\frac{7.5}{6} \times 100 [-100]$ or $\left(\frac{7.5}{6} - 1\right) [\times 100]$ oe or M1 for $\frac{7.5}{6}$

Question	Answer	Marks	Partial Marks
11(d)	40 [million]	2	M1 for $\left(1 + \frac{30}{100}\right)k = 52$ [million] oe
12(a)	$\frac{13x-4}{24}$ final answer	3	SC2 for final answer $\frac{13x+4}{24}$ or M2 for $\frac{6x+9x-2x-4}{24}$ oe or better or M1 for $\frac{6x+3(3x)-2(x+2)}{24}$ oe
12(b)	$(3x-y)(a+4y)$ final answer	1	
13	$\frac{3}{2}$ oe	4	B3 for $16r^2 = 36$ oe or better or M2 for $\pi r^2 16 = \frac{4}{3}\pi 3^3$ oe or M1 for $\pi r^2 16$ oe or $\frac{4}{3}\pi 3^3$ oe
14(a)	70 and opposite angles of a cyclic quadrilateral sum to 180 oe	2	B1 for 70 or for a fully correct reason
14(b)(i)	65	2	FT $180 - 45 - their\ 70$ for 2 marks B1 for angle $BDC = 45$ or M1 for $180 - 45 - their\ 70$ oe or for $180 - (20 + 45) - (180 - (110 + 20))$ oe
14(b)(ii)	65	1	FT <i>their (b)(i)</i>
15(a)	(1, 13)	2	B1 for one correct coordinate
15(b)	$\begin{pmatrix} -9 \\ 3 \end{pmatrix}$	2	B1 for $\begin{pmatrix} -9 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$ or SC1 for $\begin{pmatrix} 9 \\ -3 \end{pmatrix}$

Question	Answer	Marks	Partial Marks
15(c)	39	3	B2 for $ \overline{BA} = 13$ or M2 for $3\sqrt{([-]5)^2 + ([-]12)^2}$ oe or M1 for $([-]5)^2 + ([-]12)^2$ oe or $([-]15)^2 + ([-]36)^2$ oe
16(a)	12.5	3	M2 for $51.5 - 39$ oe OR B1 for [UQ =] 51.5 B1 for [LQ =] 39 OR M1 for $k - c$ where $50.25 \leq k \leq 52$ and $38 \leq c \leq 40$
16(b)	$\frac{6}{13}$ oe	3	M2 for $[2 \times] \left(\frac{4}{13} \times \frac{9}{12} \right)$ oe or B1 for $\frac{4}{13}$ and $\frac{9}{12}$ or $\frac{9}{13}$ and $\frac{4}{12}$ or M1 for $\frac{k}{13} \times \frac{c}{12}$ where $0 < k < 13$ and $0 < c < 12$ If 0 scored, SC1 for $2 \left(\frac{4}{13} \times \frac{9}{13} \right)$

Question	Answer	Marks	Partial Marks
17	$\frac{38}{45}$ cao	4	<p>B3 for $\frac{76}{90}$ oe fraction</p> <p>OR</p> <p>M3 for any complete correct method with common denominators that would reach $\frac{76}{90}$ oe e.g.</p> $\frac{28.8\dots - 2.8\dots}{100 - 10} + \frac{50}{90}$ oe $\frac{50}{90} + \frac{18}{90} + \frac{8}{90}$ oe $\frac{84.4\dots - 8.4\dots}{100 - 10}$ oe <p>or M2 for any correct method to convert $0.2\dot{8}$ to fractional form e.g.</p> $\frac{28.8\dots - 2.8\dots}{100 - 10}$ oe $\frac{2}{10} + \frac{8.8\dots - 0.8\dots}{100 - 10}$ oe <p>or M1 for correct method to add <i>their</i> fractions with a common denominator e.g.</p> $\frac{50}{90} + \text{their } \frac{26}{90}$ oe $\frac{50}{90} + \frac{18}{90} + \text{their } \frac{8}{90}$ oe <p>or for method to subtract to eliminate recurring parts</p> $28.8\dots - 2.8\dots$ oe $8.88\dots - 0.08\dots$ oe <p>or B1 for a correct conversion between a relevant recurring decimal and a fraction e.g.</p> $\frac{5}{9} = 0.\dot{5}, 0.0\dot{8} = \frac{8}{90}$

Question	Answer	Marks	Partial Marks
18(a)	$\frac{AB}{18} = \cos 60$ or $[AB =] 18\cos 60$	M1	
	$\cos 60 = \frac{1}{2}$ and $[AB =] 9$	A1	
	Correct use of Pythagoras' theorem i.e. $[CD^2 =] 6^2 + (17 - \text{their } AB)^2$ oe	M1	
	Correct evaluation for <i>their</i> AB $[CD^2 =] 36 + 64$ or $[CD =] \sqrt{36 + 64}$	M1	
	$\sqrt{100} = 10$	A1	Dep on M1A1M1M1
18(b)	$39 + 9\sqrt{3}$	4	<p>B3 for $[BE =] 9\sqrt{3}$ or for answer $k + 9\sqrt{3}$ or for answer equivalent to $39 + 9\sqrt{3}$ but not in required form</p> <p>OR</p> <p>M2 for $\frac{BE}{18} = \frac{\sqrt{3}}{2}$ oe or better</p> <p>or M1 for $\frac{BE}{18} = \sin 60$ oe or better</p> <p>M1 for $18 + 17 + 10 + \text{their } BE - 6$ oe</p> <p>OR</p> <p>M2 for $\sqrt{18^2 - \text{their } 9^2}$ oe</p> <p>or M1 for $BE^2 + (\text{their } 9)^2 = 18^2$ oe</p> <p>M1 for $18 + 17 + 10 + \text{their } BE - 6$ oe</p>
19		1	
20(a)	$14\sqrt{3}$	2	<p>B1 for $10\sqrt{3}$ or $4\sqrt{3}$ If 0 scored SC1 for answer $7\sqrt{12}$</p>

Question	Answer	Marks	Partial Marks
20(b)	$3(\sqrt{7}-2)$ oe simplified	3	B2 for $\frac{9(2-\sqrt{7})}{4-7}$ or better or M1 for $\frac{9}{2+\sqrt{7}} \times \frac{2-\sqrt{7}}{2-\sqrt{7}}$ oe
21(a)	(0, -3)	1	
21(b)	[y =] $-\frac{1}{2}x + \frac{25}{2}$ final answer	5	B1 for [midpoint =] (3, 11) soi M1 for [grad AB =] $\frac{15-7}{5-1}$ oe M1 for $\frac{-1}{\text{their gradient of AB}}$ M1 for substituting <i>their</i> (3, 11) into $y = (\text{their } m)x + c$ oe
22(a)	(-1, 1) nfw	5	B4 for $x = -1$ nfw or answer (-1, k) nfw OR B2 for $3x^2 + 2x - 1$ or B1 for two terms correct M1 for setting <i>their</i> $\frac{dy}{dx} = 0$ or stating $\frac{dy}{dx} = 0$ M1 for correct method to solve <i>their</i> 3-term quadratic e.g. $(3x-1)(x+1)$
22(b)	Correct sketch of positive cubic with minimum in correct quadrant  and minimum	2	B1 for correct shape of positive cubic

Question	Answer	Marks	Partial Marks						
22(c)	<table border="1"> <tr> <td data-bbox="306 241 587 349">If <i>their</i> y coordinate from (a) is:</td> <td data-bbox="587 241 868 349">Strict FT:</td> </tr> <tr> <td data-bbox="306 349 587 510">$> -\frac{5}{27}$</td> <td data-bbox="587 349 868 510"> $k \geq \text{their } y \text{ in } (a)$ $k \leq -\frac{5}{27}$ </td> </tr> <tr> <td data-bbox="306 510 587 678">$< -\frac{5}{27}$</td> <td data-bbox="587 510 868 678"> $k \leq \text{their } y \text{ in } (a)$ $k \geq -\frac{5}{27}$ </td> </tr> </table>	If <i>their</i> y coordinate from (a) is:	Strict FT:	$> -\frac{5}{27}$	$k \geq \text{their } y \text{ in } (a)$ $k \leq -\frac{5}{27}$	$< -\frac{5}{27}$	$k \leq \text{their } y \text{ in } (a)$ $k \geq -\frac{5}{27}$	2	B1 strict FT for each or SC1FT for non-inclusive versions of both correct strict FT inequalities
If <i>their</i> y coordinate from (a) is:	Strict FT:								
$> -\frac{5}{27}$	$k \geq \text{their } y \text{ in } (a)$ $k \leq -\frac{5}{27}$								
$< -\frac{5}{27}$	$k \leq \text{their } y \text{ in } (a)$ $k \geq -\frac{5}{27}$								
23(a)	$[\pm]\frac{x^3}{8}$ final answer	2	B1 for $\frac{x^3}{k}$ or $\frac{x^k}{8}$						
23(b)	6 nfw	4	B3 for $4x - x = 2(x + 3)$ oe or for correctly combining to a single base on each side with no brackets in the powers e.g. $2^{3x} = 2^{2x+6}$ oe or better OR M1 for $(2^4)^x$ or $(2^{-1})^x$ or $2^{2(x+3)}$ or better seen M1 for correctly forming a linear equation in x from <i>their</i> powers of <i>their</i> consistent base						